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BOX PATENT APPLICATION

Date: December 1, 1998

Honorable Commissioner of Patents and Trademarks
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Attorney Docket No.: TGI-003XX

Sir:

Transmitted herewith for filing is the **patent application** of:

Inventor: Gary R. Wolpert et al

Entitled: SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME

Enclosed are:

[x] Declaration and Power of Attorney (without signauture)
[ ] An Assignment of the invention to:
[ ] A Certified copy of a _____ application
[ ] A Verified statement re small entity status (§1.9 and §1.27)- Small Business Concern (without signature)
[ ] Citation of Art including ___ references
[x] 4 sheets of informal drawings (one set)
[X] Other: Letter Under 37 CFR 1.53
[ ] Continuation-in-part application of application Serial No._____, filed _____
[ ] _____ is hereby appointed Associate Attorney by:
Registration No.:

_____
Attorney of Record: Daniel J. Bourque
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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application	:	Gary R. Wolpert et al
Filed	:	Herewith
For	:	SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME
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I hereby certify that the following items are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and as addressed to BOX PATENT APPLICATION, Commissioner of Patents and Trademarks, Washington, D.C. 20231:

U.S. Patent application of Gary R. Wolpert et al, entitled SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME, consisting of

Specification includes:

PP 1 through 24 of Detailed Description;
PP 25 through 38 of claims 1 through 49; and
PP 39 of Abstract

Drawings as follows (one copy informal): First sheet of Fig. 1, 2, 3A, 3B, 3C; Second sheet of Fig. 4A, 4B, 5; Third sheet of Fig. 6, 7; Fourth sheet of Fig. 8, 9, 10, 11.

A Declaration and Power of Attorney, unsigned, together with a cover letter in triplicate.

The above items are deposited with signatures and dated by the filing attorney as appropriate.

Cathi Barz
Cathi Barz
Signature of Person Mailing

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application	:	Gary R. Wolpert et al
Filed	:	December 1, 1998
For	:	SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME
Attorney's Docket	:	TGI-003XX

LETTER UNDER RULE 37 CFR 1.53

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

Sir:

Pursuant to Rule 37 CFR 1.53 the enclosed application is being filed without a signed oath or declaration for the purpose of obtaining a filing date. Upon notification by the United States Patent and Trademark Office, Applicants will submit an executed declaration and power within the period specified and pay the required fee(s).

Respectfully submitted,

Gary R. Wolpert et al

By _____
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Enclosure

Docket No.: TGI-003XX

SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME

RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Patent Application Serial No. 60/067,228 filed December 2, 1997, fully incorporated herein by reference.

FIELD OF THE INVENTION

The present invention relates to security devices and in particular, to a security device or element having multiple security features for use with valuable merchandise or items.

BACKGROUND OF THE INVENTION

Counterfeiting and tampering with secure documents or instruments, such as bank notes, checks, tickets, credit cards and the like, and other valuable merchandise or items is a common problem in many fields or enterprises. To prevent counterfeiting, many secure documents and other items of value include a security device or element, such as a security thread, disposed on or in the document. The security device typically includes one or more security features, such as metallic security features, magnetic security features, or luminescent security features, that authenticate the document and prevent counterfeiting and/or

tampering.

To authenticate the document, many conventional security devices merely require that the existence of a single security feature be detected. Thus, counterfeiters need only recognize the security feature in a document or item and reproduce that one security feature in a counterfeit document or item such that the security feature is detectable to authenticate the counterfeit document. Advances in technology have brought even new and easier ways of identifying these security features and reproducing the valuable documents or instruments with the security device. Thus, a need exists for more covert security features that are not easily identified and reproduced.

One type of security thread includes metallic features, such as metallic graphic indicia, disposed on a carrier substrate. According to conventional chemical etching techniques, a chemical resist is printed on a metallic layer in the form of the graphical indicia, either positively or negatively, and de-metalization of the areas of the metallic layer not covered by the chemical resist causes the graphic indicia to be formed either negatively or positively by the remaining metallic layer. Security threads having only a metallic security feature, formed according to this method, do not provide adequate protection because the counterfeiter can easily recognize and reproduce the metallic graphic indicia.

Attempts have been made to combine multiple security features, such as metallic and magnetic features, to make

counterfeiting more difficult. In one example, magnetic ink is used to print graphic indicia that can be read by MICR detectors. However, if magnetic ink is used to print graphic indicia on or with metallic security features, the magnetic features and metallic features are easily distinguishable and identified. A counterfeiter could recognize that both magnetic and metallic security features have been used and need to be reproduced.

Other types of security threads have also used hybrid metals or alloys to form graphic indicia having both magnetic and metallic security features. However, the hybrid metals and the process for depositing or applying the hybrid metals to form the graphic indicia is costly. Also, using hybrid metals limits the ability to vary the magnetic properties that can be used.

Accordingly, a need exists for a security device having multiple security features, such as metallic and magnetic security features, that are not easily distinguishable and recognizable upon observing the security device. A need also exists for a security device in which the security feature(s) is capable of providing machine readable encoded data, e.g., pertaining to the security device or document, in addition to detectable features for authentication of the security document. What is also needed is a method of making a magnetic/metallic security device using existing chemical etching or de-metalization techniques.

SUMMARY OF THE INVENTION

The present invention features a magnetic/metallic security device for use with an item to provide multiple security features. The security device includes a carrier substrate, a metallic layer disposed on the carrier substrate, for providing metallic security features, and a magnetic layer disposed on and in substantially identical registration with at least a portion of some of the metallic layer, for providing magnetic security features. The metallic layer and the magnetic layer together form graphic indicia on the carrier substrate, either positively or negatively. In one embodiment, a coating layer is disposed over the graphic indicia formed by the metallic layer and the magnetic layer.

The magnetic/metallic security device has different embodiments in which the magnetic layer provides magnetic security features. In one embodiment, the graphic indicia is formed as magnetic characters readable by MICR detectors. In another embodiment, the magnetic layer includes a hard magnetic substance capable of being magnetized for recording data on the magnetic layer.

In a further embodiment, the magnetic layer includes at least one type of magnetic substance having at least one predetermined magnetic characteristic that is detectable, for authenticating an item having said security device. In one example, the magnetic substance is a soft magnetic pigment capable of holding a level of magnetism for a limited period of

time.

In a further embodiment, the magnetic layer includes at least first and second types of magnetic substances having at least first and second predetermined magnetic characteristics respectively. The first and second types of magnetic substances are arranged in the magnetic layer in a predetermined pattern representing data encoded with the magnetic layer such that the first and second predetermined characteristics are detectable to read the predetermined pattern and decode the data. In one example, the first and second predetermined magnetic characteristics represent binary integers, and the predetermined pattern of the first and second types of magnetic substances represents data in a binary coded format. One example of the first and second types of magnetic substances include first and second soft magnetic pigments having first and second predetermined magnetic decay rates and/or predetermined levels of magnetism.

The magnetic/metallic security device also has different embodiments in which the metallic layer provides metallic security features. In one embodiment, at least a portion of the metal layer includes at least one predetermined characteristic that is detectable, for authenticating an item having the security device.

In another embodiment, the metal layer forms a plurality of conductive regions on the substrate. The conductive regions are separated by non-conductive regions and have at least two

different predetermined lengths forming a predetermined pattern for representing encoded data. The predetermined lengths of the conductive regions are detectable to read the predetermined pattern and decode the data. In one example, the conductive regions include first and second predetermined lengths representing binary integers, and the predetermined pattern of the first and second lengths of the conductive regions encodes the data in a binary coded format.

The present invention also features a magnetic security device for use with an item. The magnetic security device comprises a carrier substrate, and a plurality of magnetic regions disposed on the carrier substrate. The plurality of magnetic regions have different predetermined magnetic characteristics and are arranged in a predetermined pattern representing data encoded by the magnetic regions. The first and second predetermined characteristics are detectable to read the predetermined pattern and decode the data.

The present invention also features a metallic security device for use with an item. The metallic security device comprises a carrier substrate, and a plurality of conductive regions disposed on the carrier substrate. The conductive regions are separated by non-conductive regions and have at least two different predetermined lengths forming a predetermined pattern for representing encoded data. The predetermined lengths of the conductive regions are detectable to read the predetermined pattern and decode the data.

The present invention also features a method of making a magnetic/metallic security device having a plurality of security features. The method comprises: providing a carrier substrate having first and second surfaces; applying a metallic layer to at least a portion of the first surface of the carrier substrate; applying a magnetic layer over at least a portion of the metallic layer; and etching the magnetic layer and the metallic layer such that the magnetic layer and the metallic layer are in substantially identical registration and together form graphic indicia on the carrier substrate.

The preferred method of making the magnetic/metallic security device comprises: providing a carrier substrate having first and second surfaces; applying a metallic layer to at least a portion of the first surface of the carrier substrate; applying a magnetic chemical resist to at least a portion of the metallic layer, wherein the magnetic chemical resist forms a pattern of graphic indicia on the metallic layer; and chemically etching the metallic layer to remove exposed portions of the metallic layer, wherein chemical etching is resisted by the magnetic chemical resist such that the magnetic chemical resist and a portion of the metallic layer underlying the magnetic chemical resist together form the pattern of graphic indicia on the carrier substrate. The method can also include applying an additional layer over the graphical indicia formed by the magnetic chemical resist and the portion of the metallic layer underlying the magnetic chemical resist.

DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the present invention will be better understood by reading the following detailed description, taken together with the drawings wherein:

Fig. 1 is a top view of a document or item having a security device, according to the present invention;

Fig. 2 is an enlarged top view of a magnetic/metallic security device, according to one embodiment of the present invention;

Figs. 3A-3C are side, cross-sectional views of a method of making the magnetic/metallic security device, according to the present invention;

Fig. 4A is a top view of a magnetic/metallic security device having magnetic tracks, according to one embodiment of the present invention;

Fig. 4B is a schematic and graphical illustration of the magnetic/metallic security device having machine readable encoded magnetic and metallic security features, according to one embodiment of the present application;

Fig. 5 is a functional block diagram of a device for detecting or reading the magnetic security features, according to one embodiment of the present invention; and

Fig. 6 is a schematic illustration of a machine readable encoded metallic security feature, according to one embodiment the present invention;

Fig. 7 is a side cross-sectional view of the machine readable encoded metallic security feature and capacitive sensors, for reading the encoded data, according to one embodiment of the present invention;

Fig. 8 is an enlarged top view of a machine readable metallic security feature, according to another embodiment of the present invention;

Fig. 9 is an enlarged top view of a machine readable metallic security feature, according to a further embodiment of the present invention;

Fig. 10 is an enlarged view of a machine readable metallic security feature, according to yet another embodiment of the present invention; and

Fig. 11 is a schematic representation of a security instrument, according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A security device 10, Fig. 1, according to the present invention, is used with an item 12 to prevent counterfeiting or reproduction of the item 12 or another article to which the item 12 is attached. The security device 10 has multiple security features, such as metallic security features and magnetic security features, capable of being encoded with data in a machine readable format in addition to providing authentication of the item 12. The metallic and magnetic security features are preferably formed by using a magnetic chemical resist, as will be described in

greater detail below, such that at least some of the metallic and magnetic security features are generally perfectly superimposed and substantially indistinguishable by the naked eye.

The security device 10 can be used in secure documents including, but not limited to, banknotes, currencies, passports, visas, titles, licenses, registrations, checks, money orders, original documents, certificates of authority, event tickets and gift certificates. The security device 10 provides authentication of the secure document and/or is encoded with data pertaining to the secure document or the security device itself.

The security device 10 can also be used in labels, tags or packaging material including, but not limited to, pressure sensitive labels, glue-on labels, in-mold labels, heat-shrink labels, woven labels, tear tapes, shrink-caps and collars, and stickers. In this example, the magnetic/metallic security device 10 authenticates and/or is encoded with data relating to the articles to which the labels or packaging material is attached, such as liquor or other commodities of value.

The security device 10 can further be used with a laminated article including, but not limited to, passports, ID Cards, access cards, licenses, and credit/debit cards. In this example, the security device 10 is used to authenticate the laminated article and/or is encoded with data relating to the article or the owner of the article.

The security device 10 can also be used in tickets or passes including, but not limited to, event tickets, transit tickets,

lottery tickets, and admittance passes. According to this example, the security device 10 can provide authentication of the ticket or pass itself and/or can be encoded with data relevant to the event. The present invention also contemplates other uses and applications for the security device 10 to prevent counterfeiting, reproduction or otherwise provide security for items or articles of value.

According to the exemplary embodiment, the security device 10 is formed as a thread or strip that extends partially or entirely along the item 12 in any direction. The security device 10 can be embedded within the item 12, adhered to the item 12, woven in the item 12, or laminated between multiple layers of the item 12. The item 12 can also include multiple security devices 10 according to the present invention.

The security device 10, Fig. 2, includes a carrier substrate 14, for example, formed as a thread or strip. One type of carrier substrate 14 is made of a polyester, polyvinyl carbonate or polypropylene film on paper. Alternatively, the carrier substrate 14 can be a plastic film or metallized paper, or other type of material used in conventional security threads.

In the exemplary embodiment, the security device 10 includes graphic indicia 16 formed from a metallic/magnetic medium disposed on the carrier substrate 14. The graphic indicia 16 can be formed positively on the carrier substrate 14, i.e. the graphic indicia 16 is composed of the magnetic/metal medium. The graphic indicia 16 can also be formed in the reverse, i.e. the area 18 surrounding

the graphic indicia 16 is composed of the magnetic/metallic medium. The magnetic/metallic security device 10 can also be formed with a combination of positive and reverse graphic indicia 16. The graphic indicia 16 can be printed as line work in which solid areas are printed in the desired shape or as halftone in which tiny dots are printed with varying spacing to vary the shading. Although the graphic indicia 16 are shown as alphanumeric characters, the present invention contemplates any type of symbol, design, shape or other graphic indicia.

The method of making the exemplary security device 10, Figs. 3A and 3B, according to the present invention, includes first applying a metallic layer 20 to the carrier substrate 14. The metallic layer 20 preferably includes aluminum that has been sputtered or vapor deposited on the carrier substrate 14. Alternatively, the metallic layer 20 can be a metallic foil or other type of metal applied to the carrier substrate 14.

Next, a magnetic chemical resist 22 is applied to the metallic layer 20 according to the desired pattern of graphic indicia 16, e.g. printed in positive, reverse or both. The magnetic chemical resist 22 includes film-forming chemical resisting resins containing ferromagnetic and or other magnetic pigments. Examples of the chemical resist include, but are not limited to, solvent based, water based or solid based, ultra violet (UV) or electron beam (EB) polymerized resin systems or other conventional chemical resist resins. The magnetic pigments include both hard and soft magnetic pigments, as will be described

in greater detail below, typically ranging from about 200 oersteds to 10,000 oersteds.

An etching process is then performed on the magnetic/metallic security device 10, Fig. 3B, that removes portions of the metallic layer 20 that are not protected by the magnetic chemical resist 22. The etching process includes conventional chemical etching processes known to those of ordinary skill in the art. The magnetic chemical resist 22 resists the chemical attack and remains on the underlying metallic layer 20, arranged in the desired printed pattern. The magnetic chemical resist 22 is superimposed in substantially identical registration with at least a portion of the underlying metal layer 20, thereby providing both magnetic and metallic security features that are substantially indistinguishable in at least some areas of the security device 10. The magnetic chemical resist 22 thus acts both to resist chemical attack while etching the metallic layer 20 and to provide a magnetic security feature superimposed on the metallic security feature so as to be not easily identified.

Alternatively, the graphical indicia 16 can be formed using other types of techniques including, but not limited to, lasers, mechanical scribing, abrading, and the like. In one example, a substrate containing a metallic layer is over-coated with a magnetic layer and subjected to a laser etching process. The laser etching selectively removes both the magnetic and metallic layers and forms the desired graphical indicia 16 having the magnetic security feature superimposed substantially identically

over the metallic security feature.

The present invention also contemplates using an additional coating or laminate 24, Fig. 3C, over the graphic indicia 16, on one or both sides. In one example, the additional layer 24 is used to help hide the security device 10 when embedded in paper and viewed with reflected light. In this case, however, the graphic indicia 16 created with the magnetic chemical resist will remain observable when viewed in transmitted light.

The security device 10, Figs. 4A and 4B, can be encoded with machine readable analog or digital data as well as provide authentication in multiple ways by using the various properties of the metallic and magnetic security features. Using one or more metallic and/or magnetic properties to authenticate the security device 10 or item 12 involves detecting whether or not the one or more properties are present on the security device 10. Using the one or more metallic and/or magnetic properties to encode as analog or digital data involves detecting and reading a combination of properties that represents a numerical code, e.g. in Binary-Coded Decimal (BCD) format, and decoding the code to determine the data represented thereby.

The magnetic security feature is capable of authenticating an item or encoding data pertaining to the item in multiple ways. In one example, the graphic indicia 16 are formed as magnetic characters that can be read by conventional MICR detectors. In this example, the graphic indicia 16 is preferably formed as positive text.

According to another example, the magnetic chemical resist 22 includes a hard magnetic pigment that is capable of being magnetized in the same manner as a magnetic recording tape. In this example, graphic indicia 16, Fig. 4A, is preferably formed as reverse text such that the magnetic chemical resist 22 including the hard magnetic pigment forms one or more magnetic tracks 23a, 23b. Authenticating data or other information can be written to and read from the magnetic track(s) 23a, 23b using conventional recording devices and read using conventional readers.

According to a further example, the magnetic chemical resist 22 includes a soft magnetic that can be magnetized and holds a level of magnetism for a limited period of time depending upon the characteristics or properties of the soft magnetic. Using the soft magnetic allows the magnetic security feature to be further concealed because the magnetic properties will not be detected unless the soft magnetic is first magnetized. Soft magnetics typically have predetermined magnetic characteristics, such as a level of magnetism that they can achieve and rate of decay of magnetic charge. Soft magnetics can be used to provide authentication, by first magnetizing the magnetic/metallic security device 10 and then detecting the existence of the magnetic, the level of magnetism, or the rate of decay.

By providing soft magnetics with varying magnetic characteristics, such as different levels of magnetism which can be attained or rates of decay, the graphic indicia 16, Fig. 4B, can further be used to encode data in a machine readable format.

For example, the graphic indicia segments 16a-16d can include two types of soft magnetic pigments, one having a fast decay rate 28a and one having a slow decay rate 28b, that represent binary integers encoding data in BCD format. Some segments 16a, 16c of the graphic indicia are printed with magnetics having a fast decay rate and other segments 16b, 16d of the graphic indicia are printed with magnetics having a slow decay rate. Data is thereby encoded in BCD format (0101) by providing a predetermined pattern of segments 16a-16d having the two different types of magnetic pigments. The encoded data can include verification data or other data pertaining to the item 12.

According to one method of the present invention, different formulations of the magnetic chemical resist 22 having magnetic pigments with different magnetic properties or characteristics are printed onto the metallic layer 20 using multiple print stations, such as an offset printing press similar to the type used for multicolor printing. Using multiple print stations allows graphic indicia to be printed in any desired pattern using various combinations of magnetic chemical resists having various different magnetic properties.

The present invention also contemplates simultaneously using the level of magnetism and decay rate properties of the soft magnetics, as well as a mixture of hard and soft magnetics to achieve any desired combination of magnetic characteristics or properties for authenticating an item or encoding data pertaining to an item. Although the exemplary embodiment described above

refers to two different magnetic properties for encoding data in BCD format, any number of different properties can be used to encode data in other numerical formats. In addition to providing authentication and encoding data using the magnetic security features, the metallic security feature can also provide authentication and/or encode data, e.g., by forming the segments 16a-16d with different lengths of metal representing data in BCD format (1100), as will be described in greater detail below.

The device 30, Fig. 5, used to read the magnetic/metallic security features includes at least a detector/reader 34 for detecting one or more characteristics of the metal and/or magnetic layers and/or for reading the predetermined pattern formed by the metal and magnetic regions having different characteristics. After detecting the one or more characteristics, an authenticator 36 determines whether the security device is authentic. After reading the predetermined pattern, a decoder 38 decodes the data represented by the predetermined pattern.

When the security device 10 includes magnetic security features having soft magnetics, the device 30 further includes a magnetic charger 32 that charges the soft magnetic pigments prior to the reader 34 detecting the features of the magnetics, such as the existence of magnetics, the level of magnetization, the decay rate of the magnetic, or other detectable magnetic characteristics. Authentication can be made based upon whether the soft magnetic is present, whether the soft magnetic has a predetermined level of magnetization, or whether the soft magnetic

has a predetermined decay rate.

Decoding is performed by determining the pattern of the different magnetic characteristics read by the reader 34. For example, if the magnetic/metallic security device 10 shown in Fig. 4 is magnetized with the magnetizer 32, after a period of time, the segments 16b, 16d having a slower decay rate 28b will remain magnetized while the segments 16a, 16c having a faster decay rate 28a will no longer be magnetized. The reader 34 distinguishes the different magnetic properties and determines the predetermined pattern of magnetic properties. From the predetermined pattern of magnetic properties, the corresponding binary representation (0101) and the data represented thereby is decoded.

The metallic security feature 40, Fig. 6, according to one embodiment of the present invention, includes a plurality of conductive regions 42 and non-conductive regions 44, such as a metallized polyester film having demetalized breaks, for example, formed using the chemical resist process described above. Each non-conductive region 44 is disposed between two of the conductive regions 42. The plurality of conductive regions 42 and non-conductive regions 44 form a predetermined pattern that represents a verification code or data encoded with the metallic security feature 40.

Each conductive region 42 has one of at least two predetermined lengths, for example, long conductive regions 42a and short conductive regions 42b. Each predetermined length corresponds to a predetermined value so that the data can be

determined by detecting the length of each conductive region 42 and determining a corresponding value.

In one example, long conductive regions 42a correspond to a "1" and the short conductive regions 42b corresponds to a "0". According to this example, the long and short conductive regions 42a, 42b are used to encode data in BCD format. The long and short conductive regions 42a, 42b are arranged in a predetermined series corresponding to the binary representation of the data to be encoded. In this example, the detector/reader 34 detects the length of each conductive region 42 in the series (e.g. long or short) and determines the corresponding binary representation. To provide authentication, the binary representation will be matched to a predefined verification code for an item 12. To read encoded data, the binary representation will be further decoded.

Accordingly, depending upon the arrangement of the conductive regions 42 having varying lengths, a virtually unlimited number of verification codes or data can be encoded using the machine readable metallic security feature 40. The machine readable metallic security feature 40 according to the present invention allows encoded data to be easily varied by varying the sequence of the conductive regions 42a, 42b. The conductive regions can be formed according to various designs provided that they are conductive over one of the predetermined lengths, as will be described in greater detail below. Although only two lengths are discussed herein for simplification, the present invention contemplates using conductive regions of any number of different

lengths for encoding data. For example, octal data can be encoded using eight (8) different length conduction regions.

One method of reading and verifying the machine readable metallic security feature 40, Fig. 7, is by detecting the long and short conductive regions 42a, 42b using capacitive verification or detection, such as disclosed in U.S. Patent No. 5,419,424 issued to Harbaugh and incorporated herein by reference. According to capacitive verification methods, the machine readable metallic security feature 40 is positioned proximate capacitive sensors 50 coupled to a verification device (not shown). When capacitive sensors 50 are positioned proximate conductive regions 42, the conductive regions 42 capacitively couple one sensor 52a to another sensor 52b. Where there is a non-conductive region 44 or "break" in the conductivity, there will be no capacitive coupling between the adjacent capacitive sensors 52b, 52c on either side of the non-conductive region 44. By detecting the changes in capacitance when the machine readable encoded metallic security feature 40 is positioned proximate the capacitive sensors 50, the presence of the long and short conductive regions 42a, 42b are effectively detected. The present invention also contemplates other verification devices and methods capable of detecting the lengths of the conductive regions 42a, 42b, such as various electromagnetic verification devices.

The conductive regions 42 of the machine readable encoded metallic security feature 40 are preferably formed from a metallic material, such as aluminum. Exemplary methods include, but are not

limited to, forming the conductive regions 42 by metalization of a polyester film, hot stamped foil, and printing the conductive regions 42 with a metallic ink. The present invention contemplates other types of metallic material and methods of forming the metallic conductive regions and non-conductive breaks.

The machine readable encoded metallic security feature 40 and the security device 10 in which it is used are preferably designed to allow minimal "stretching," for example, approximately 5% or less variation in length. Also, the detection of the lengths of the conductive regions 42a, 42b should account for the potential stretching of the security device and machine readable encoded metallic security feature 40, for example, by accounting for the potential percentage of change in length.

According to another embodiment of the machine readable encoded metallic security feature 40a, Fig. 8, of the present invention, each conductive region 42a, 42b includes indicia 46 disposed thereon. Indicia 46 printed or disposed on the conductive regions 42a, 42b can be used for providing an additional verification code or data or can be used to provide false patterns that deceive the counterfeiter and hide the true verification code. Such indicia includes alpha-numeric characters 46a, bar codes 46b, or other designs 46c. The indicia 46a-46c according to this embodiment is printed or disposed on the conductive regions 42a, 42b without breaking the conductivity of each conductive region 42a, 42b and without affecting the capacitive detection of the length of each conductive region 42a,

42b using capacitive sensors 52.

According to another embodiment of the machine readable encoded metallic security feature 40b, Fig. 9, the conductive regions 42 are formed as conductive indicia regions 62a-62c formed from a conductive material, for example, printed with metallic ink or formed with a chemical resist process. The conductive indicia regions 62a, 62c are established by having the individual characters or symbols 49a-49f of the indicia connected at contact points 48 and separated at the non-conductive regions 44. The conductive indicia regions 62a-62c thus have predetermined lengths and are arranged in predetermined patterns representing the encoded data to be detected, as discussed above. The conductive indicia regions 62a-62c include alpha-numeric characters as well as other symbols or characters used for providing an additional verification code or to provide false patterns that deceive the counterfeiter and hide the true encoded data.

A further embodiment of the machine readable encoded metallic security feature 40c, Fig. 10, of the present invention includes conductive regions 42a-42c, such as narrow regions of metallic material, and non-conductive indicia regions 64a-64c breaking the conductivity between the conductive regions 42a-42c. For example, specific alpha-numeric characters or other symbols can be formed of non-conductive material or by a chemical resist or demetalizing process between the conductive regions 42a-42c to provide the "break" in conductivity. The alpha-numeric characters or other symbols constituting the non-conductive indicia regions 64a-64c

further provide additional data or codes and false patterns that deceive the counterfeiter and hide the true encoded data.

The present invention contemplates using the magnetic security features and metallic security features alone or together on a security device. Any number of the magnetic or metallic properties described above can be used individually or combined with other properties to provide authentication of an item, encode data pertaining to an item, or both.

According to the various embodiments of the present invention, one or more security devices or threads 10, Fig. 11, can be provided in various locations on or embedded in a secure document or instrument 70. The one or more security devices 10 are also readable in various directions as well as right side up or upside down. In one example, the secure instrument 70 is formed by gluing the security device 10 between two half-weight layers of paper which are then laminated together. In this example, the security device 10 is preferably unlaminated so that any attempt to delaminate the instrument 70 and remove the security device 10 will cause the paper laminating adhesive to remove the metallic and/or magnetic security features and alter the security feature or encoded data.

One example of the instrument 70 is a ticket used for sporting events, concerts, theater, shows, lotteries, transportation, theme parks, fairs, and other events. The security device 10 in the ticket can be encoded with a predetermined authentication code or encoded data that can be read

when the security instrument 70 is presented, e.g. upon admission to a particular event. In one example, one full code 72 appears in approximately 2.5 in.

Accordingly, the security device of the present invention authenticates an item and/or is encoded with data pertaining to the item in numerous ways with one or more security features, such as metallic security features and magnetic security features that generally appear together as one single security feature. The security features and encoded data are thus more difficult to identify and reproduce. The method of making the security device using chemical etching and a magnetic chemical resist results in a magnetic security feature that is substantially indistinguishable from a metallic security feature. The method of printing graphic indicia using a magnetic chemical resist also facilitates the use of magnetic pigments having different magnetic characteristics or properties by printing different formulations of the magnetic chemical resist.

Modifications and substitutions by one of ordinary skill in the art are considered to be within the scope of the present invention which is not to be limited except by the claims which follow.

What is claimed is:

CLAIMS

1. A magnetic/metallic security device for use with an item to provide multiple security features, said magnetic/metallic security device comprising:

a carrier substrate;

a metallic layer disposed on at least a portion of said carrier substrate, for providing metallic security features; and

a magnetic layer disposed on and in substantially identical registration with said metallic layer, for providing magnetic security features, wherein said metallic layer and said magnetic layer together form visually identifiable graphic indicia on said at least a portion of said carrier substrate.

2. The magnetic/metallic security device of claim 1, wherein said magnetic layer includes a chemical resist.

3. The magnetic/metallic security device of claim 1, wherein said visually identifiable graphic indicia is formed as magnetic characters readable by MICR detectors.

4. The magnetic/metallic security device of claim 1, wherein said magnetic layer includes a hard magnetic substance capable of being magnetized for recording data on said magnetic layer.

5. The magnetic/metallic security device of claim 1, wherein said magnetic layer includes at least one type of magnetic substance having at least one predetermined magnetic characteristic, and wherein said at least one predetermined magnetic characteristic is detectable, for authenticating an item having said security device.

6. The magnetic/metallic security device of claim 5, wherein said at least one type of magnetic substance is a soft magnetic pigment capable of holding a level of magnetism for a limited period of time, and wherein said at least one predetermined magnetic characteristic includes said level of magnetism capable of being held by said soft magnetic pigment and a rate of decay of said level of magnetism over said limited period of time.

7. The magnetic/metallic security device of claim 1, wherein said magnetic layer includes at least first and second types of magnetic substances having at least first and second predetermined magnetic characteristics respectively, and wherein said first and second types of magnetic substances are arranged in said magnetic layer in a predetermined pattern representing data encoded with said magnetic layer such that said first and second predetermined characteristics are detectable to read said predetermined pattern and decode said data.

8. The magnetic/metallic security device of claim 7, wherein said first and second predetermined magnetic characteristics represent binary integers, and wherein said predetermined pattern of said first and second types of magnetic substances represents data in a binary coded format.

9. The magnetic/metallic security device of claim 7, wherein said first and second types of magnetic substances having said first and second predetermined magnetic characteristics include first and second soft magnetic pigments having first and second predetermined magnetic decay rates.

10. The magnetic/metallic security device of claim 7, wherein said first and second types of magnetic substances having said first and second predetermined magnetic characteristics include first and second soft magnetic pigments capable of holding first and second predetermined levels of magnetism.

11. The magnetic/metallic security device of claim 1, wherein at least a portion of said metal layer includes at least one predetermined characteristic, and wherein said at least one predetermined magnetic characteristic is detectable, for authenticating an item having said security device.

12. The magnetic/metallic security device of claim 1 wherein said metal layer forms a plurality of conductive regions on said

substrate, wherein said conductive regions are separated by non-conductive regions and have at least two different predetermined lengths forming a predetermined pattern for representing encoded data, and wherein said predetermined lengths of said conductive regions are detectable to read said predetermined pattern and decode said data.

13. The magnetic/metallic security device of claim 12, wherein said conductive regions include first and second predetermined lengths representing binary integers, and wherein said predetermined pattern of said first and second lengths of said conductive regions encodes said data in a binary coded format.

14. The magnetic/metallic security device of claim 12, wherein said data encoded by said predetermined pattern of said conductive regions is a verification code.

15. The magnetic/metallic security device of claim 1, wherein said visually identifiable graphic indicia is formed positively on said carrier substrate by said magnetic layer and said metallic layer underlying said magnetic layer.

16. The magnetic/metallic security device of claim 1, wherein said visually identifiable indicia is formed negatively on said carrier substrate by said magnetic layer and said

metallic layer underlying said magnetic layer.

17. The magnetic/metallic security device of claim 1, further including a coating layer disposed over said visually identifiable indicia formed by said metallic layer and said magnetic layer.

18. The magnetic/metallic security device of claim 17, wherein said visually identifiable indicia is hidden when viewed by reflected light and is observable when viewed by transmitted light.

19. The magnetic/metallic security device of claim 1, further including at least one magnetic track disposed along at least a portion of said substrate, for recording data.

20. A magnetic security device for use with an item, said magnetic security device comprising:

a carrier substrate; and

a plurality of magnetic regions disposed on said carrier substrate, wherein said plurality of magnetic regions have different predetermined magnetic characteristics, wherein said plurality of magnetic regions having different predetermined magnetic characteristics are arranged in a predetermined pattern representing data encoded by said magnetic regions such that said first and second predetermined characteristics are detectable to read said predetermined pattern and decode said data.

21. The magnetic security device of claim 20, wherein said different predetermined characteristics include at least first and second predetermined magnetic characteristics representing binary integers, and wherein said predetermined pattern of said magnetic regions having said first and second predetermined magnetic characteristics represents data in a binary coded format.

22. The magnetic security device of claim 20, wherein said magnetic regions having said different predetermined magnetic characteristics include at least first and second types of soft magnetic pigments having first and second predetermined magnetic decay rates.

23. The magnetic security device of claim 20, wherein said magnetic regions having said different predetermined magnetic characteristics include at least first and second types of soft magnetic pigments capable of holding first and second predetermined levels of magnetism.

24. The magnetic security device of claim 20, wherein said magnetic regions are formed as graphic indicia on said carrier substrate.

25. A metallic security device for use with an item, said metallic security device comprising:

a carrier substrate; and

a plurality of conductive regions disposed on said carrier substrate, wherein said conductive regions are separated by non-conductive regions and have at least two different predetermined lengths forming a predetermined pattern for representing encoded data, and wherein said predetermined lengths of said conductive regions are detectable to read said predetermined pattern and decode said data.

26. The metallic security device of claim 25, wherein said conductive regions include first and second predetermined lengths representing binary integers, and wherein said predetermined pattern of said first and second lengths of said conductive regions encodes said data in a binary coded format.

27. The metallic security device of claim 25, wherein said conductive regions are formed as graphic indicia and said non-conductive regions are formed as breaks between said graphic indicia.

28. The metallic security device of claim 25, wherein said non-conductive regions are formed as graphic indicia and said conductive regions are formed around said graphic indicia.

29. A method of making a magnetic/metallic security device having a plurality of security features, said method comprising:

providing a carrier substrate having first and second surfaces;

applying a metallic layer to at least a portion of said first surface of said carrier substrate;

applying a magnetic layer over at least a portion of said metallic layer; and

etching said magnetic layer and said metallic layer such that at least a portion of said magnetic layer and said metallic layer are in substantially identical registration and together form visually identifiable indicia on said carrier substrate.

30. The method of claim 29, wherein etching said magnetic layer and said metallic layer includes chemically etching said magnetic layer and said metallic layer.

31. The method of claim 29, wherein etching said magnetic layer and said metallic layer includes laser etching said magnetic layer and said metallic layer.

32. The method of claim 29, wherein etching said magnetic layer and said metallic layer includes mechanically scribing said magnetic layer and said metallic layer.

33. The method of claim 29, wherein said magnetic layer

includes at least first and second types of magnetic substances having at least first and second predetermined magnetic characteristics respectively, and wherein said magnetic layer is applied such that said first and second types of magnetic substances are arranged in said magnetic layer in a predetermined pattern.

34. The method of claim 29, wherein said metallic layer is etched such that said metallic layer forms a plurality of conductive regions on said substrate, wherein said conductive regions are separated by non-conductive regions and have at least two different predetermined lengths forming a predetermined pattern.

35. A method of making a magnetic/metallic security device having a plurality of security features, said method comprising:

providing a carrier substrate having first and second surfaces;

applying a metallic layer to at least a portion of said first surface of said carrier substrate;

applying a magnetic chemical resist to at least a portion of said metallic layer, wherein said magnetic chemical resist forms a pattern on said metallic layer; and

chemically etching said metallic layer to remove exposed portions of said metallic layer, wherein chemical etching is resisted by said magnetic chemical resist such that said magnetic chemical resist and a portion of said metallic layer underlying said magnetic chemical resist together form said pattern on said carrier substrate.

36. The method of claim 35, wherein said magnetic chemical resist includes a film-forming chemical resisting resin containing magnetic pigments.

37. The method of claim 36, wherein said film-forming chemical resisting resin includes a resin selected from the group consisting of solvent based resins, water based resins, solid based resins, ultra violet polymerized resins, and electron beam polymerized resins.

38. The method of claim 36, wherein said magnetic pigments include soft magnetic pigments having at least one predetermined magnetic characteristic.

39. The method of claim 35 wherein the step of applying said magnetic chemical resist includes printing said graphic indicia using said magnetic chemical resist.

40. The method of claim 35 further including:

applying an additional layer over said graphical indicia formed by said magnetic chemical resist and said portion of said metallic layer underlying said magnetic chemical resist.

41. A method of authenticating a magnetic/metallic security device comprising the steps of:

writing data to a magnetic layer disposed on at least a portion of a carrier substrate;

reading magnetic data from said magnetic layer; and

comparing said read magnetic data with expected magnetic data.

42. The method of claim 41 wherein said expected magnetic data includes predetermined magnetic data.

43. The method of claim 42 wherein said predetermined magnetic data includes analog data.

44. The method of claim 42 wherein said predetermined magnetic data includes digital data.

45. The method of claim 41 wherein said magnetic data includes a magnetic level.

46. The method of claim 45 wherein said magnetic level is selected from the group consisting of a high magnetic level, a low magnetic level and a medium magnetic level.

47. The method of claim 45 wherein said expected data includes the rate of decay of said magnetic level.

48. The method of claim 41 further including before the step of writing data to said magnetic layer the step of determining the presence of a magnetic layer on said magnetic/metallic security device.

49. A method of claim 41 further including before the step of writing data to said magnetic layer the step of determining the presence of a metallic layer on said magnetic/metallic security device.

ABSTRACT

A security device having multiple security features is used with an item, such as a secure document, ticket, label or tag, to authenticate the item and/or encode data pertaining to the item. One example of the security device includes a carrier substrate, a metallic layer disposed on the carrier substrate, and a magnetic layer disposed on the metallic layer in substantial registration with at least a portion of the metallic layer, thereby providing both metallic security features and magnetic security features. The metallic layer and the magnetic layer also form graphic or visually identifiable indicia on the carrier substrate to provide a visual security feature. According to one method, the metallic layer is applied to the carrier substrate, the magnetic layer is applied to the metallic layer, and the layers are etched to form the graphic indicia. The magnetic layer can, in one embodiment, include a magnetic chemical resist that is printed on the metallic layer in the form of the graphic indicia. The magnetic security features use one or more magnetic characteristics, such as the level of magnetism and decay rate characteristic of soft magnetics, to authenticate and/or to encode data. The magnetic security feature may also include magnetic tracks for recording data. The metallic security features use different lengths of conductive regions to authenticate and/or encode data.

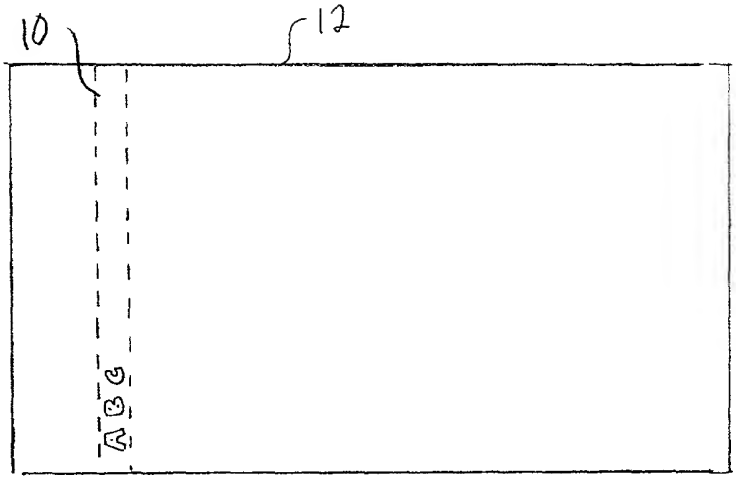

FIG. 1

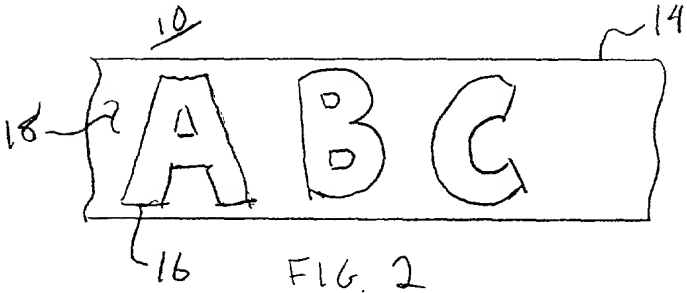

FIG. 2

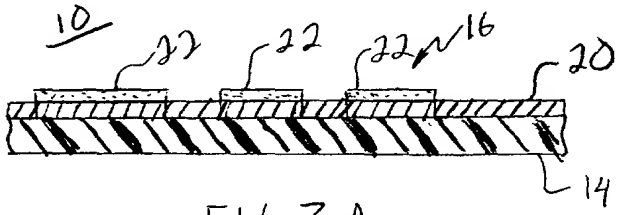

FIG. 3A

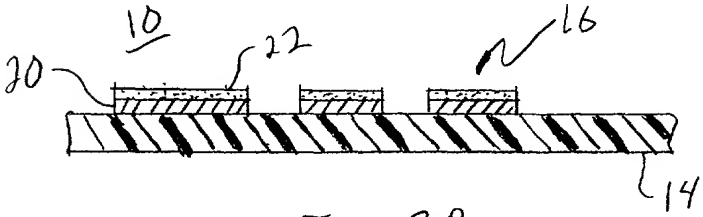

FIG. 3B

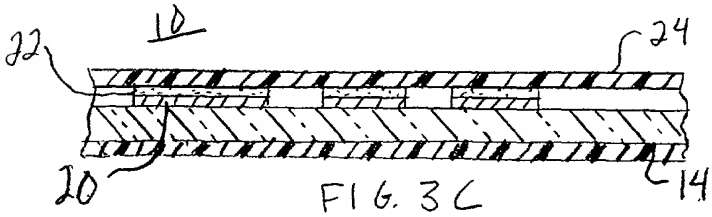

FIG. 3C

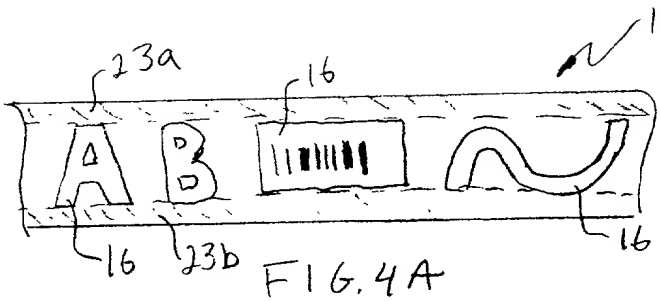

FIG. 4A

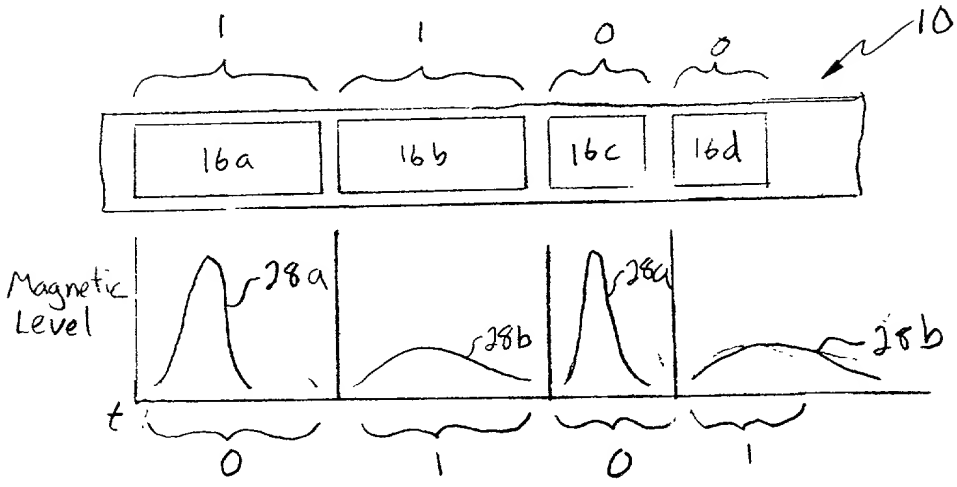

FIG. 4B

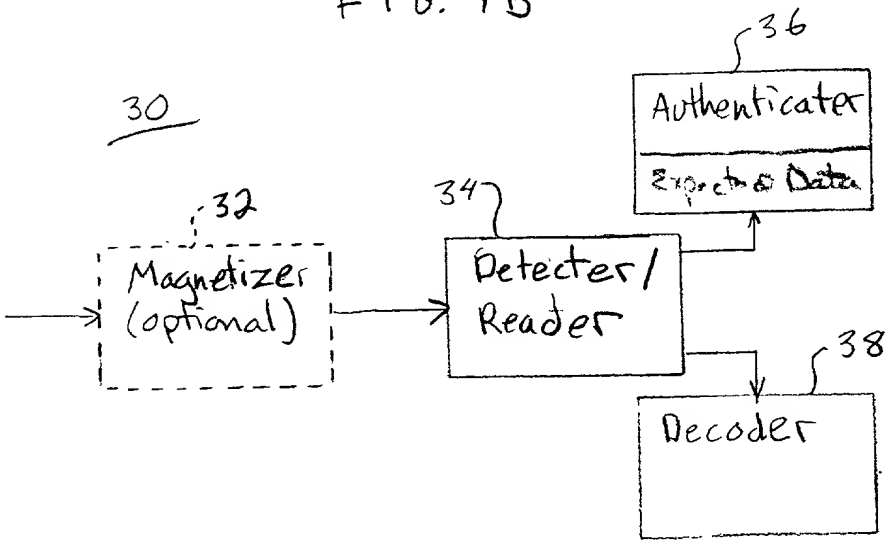

FIG. 5

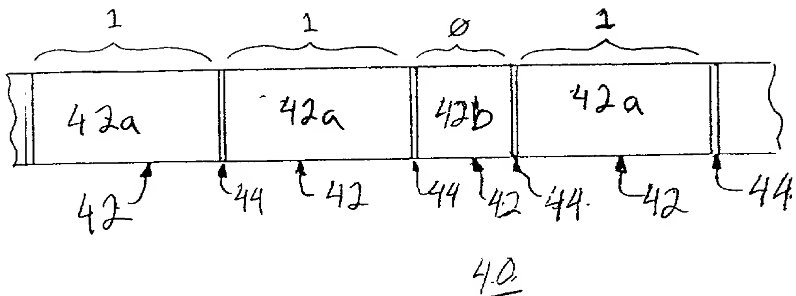
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Fig. 6

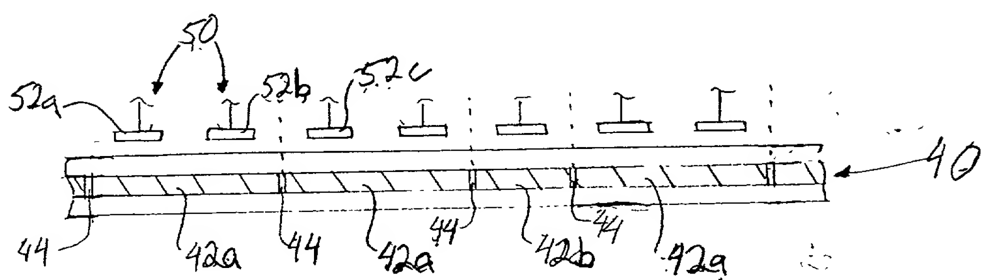
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Fig. 7

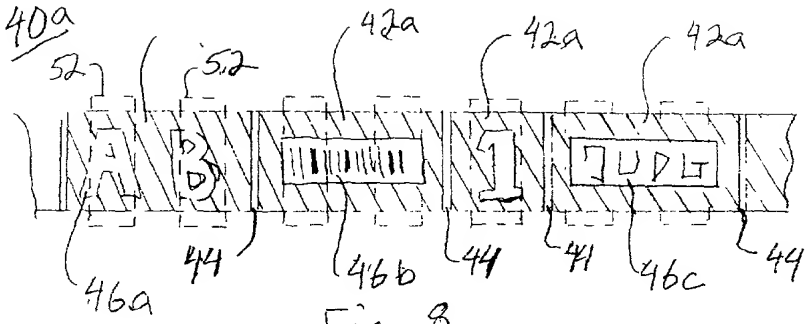

Fig. 8

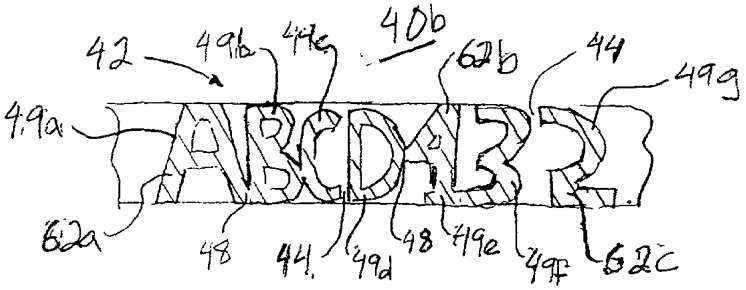

Fig. 9

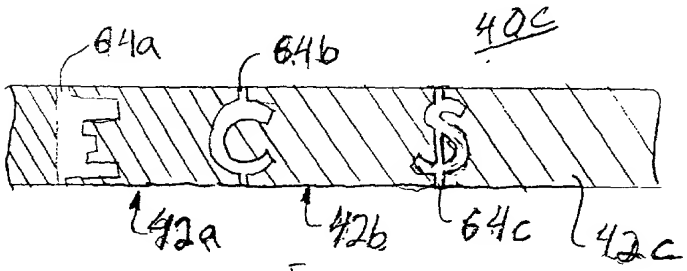

Fig. 10

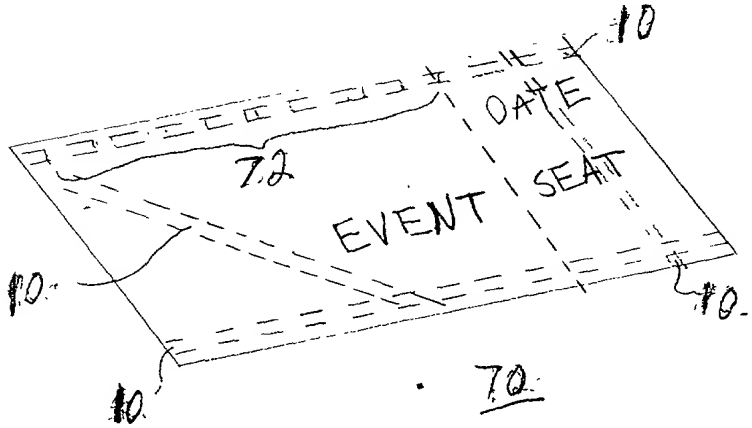

Fig. 11

DECLARATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
SECURITY DEVICE HAVING MULTIPLE SECURITY FEATURES AND METHOD OF MAKING SAME

the specification of which (check one):

[X] **is attached hereto.** [ ] **was filed _____ as Serial No. _____; amended on _____ (if applicable).**

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations §1.56(a).

I hereby claim foreign priority benefits under Title 35 USC 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)		Date Filed	Priority Claimed
	[ ] [ ]		
(Number)	(Country)	(Day/Month/Year)	Yes No
	[ ] [ ]		
(Number)	(Country)	(Day/Month/Year)	Yes No

I hereby claim the benefit under Title 35 USC 120 of any United States application(s) listed below and insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35 USC 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (Filing Date) (Patented/pending/abandoned)

(Application Serial No.) (Filing Date) (Patented/pending/abandoned)

I hereby claim the benefit under Title 35 USC 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)	(Patented/pending/abandoned)
60/067,228	12/2/97	pending

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business connected therewith in the Patent and Trademark Office, and to file with the USRO any International Application based thereon.

Daniel J. Bourque, 35,457
Kevin J. Carroll, 36,384
James T. Sullivan, 36,288

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835 Hanover Street, Suite 303
Manchester, NH 03104
Telephone: (603) 623-5111
Facsimile: (603) 624-1432

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Signature: (Please sign and date in permanent ink.) **X**		**Date signed:** **X**

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Signature: (Please sign and date in permanent ink.) **X**		**Date signed:** **X**